

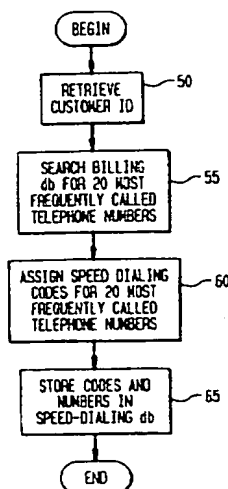
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(54) Title: AUTOMATIC GENERATION OF SPEED DIALING REPERTORY IN TELECOMMUNICATIONS NETWORKS



(57) Abstract

A telecommunications network element automatically creates a database (25) for use by network users to speed access to network addresses. In accordance with an illustrative embodiment of the invention relating to telephone network speed dialing, the technique involves the automatic determination of likely called telephone numbers (55) for a given customer based on records of actual network usage (15) by the customer. Such records are examined for a given period of time to determine a set of most frequently called numbers. These numbers are then stored as a telephone number repertory file in a network node database (25). This file is associated with the customer's own telephone number. Each frequently dialed number is stored with a corresponding code which may be searched as an index to the numbers (65). The correspondence between the stored numbers and codes is reported to the customer so that the customer may "speed-dial" the code and, through conventional operation of the node, initiate a network connection to the called party.

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AUTOMATIC GENERATION OF SPEED DIALING REPERTORY IN TELECOMMUNICATIONS NETWORKS

Field of the Invention

The present invention relates to repertory dialing systems and more particularly to the creation and use of a speed dialing system in a telecommunications network.

Background of the Invention

Repertory speed dialing is a well-known concept. The basic idea is that telephone numbers can be abbreviated with short codes. When one of the shortened codes is provided to an automatic speed dialing system, the system converts the received code to a corresponding telephone number (usually through a table look-up operation with the code as an index to the table) and then "dials" the number for the calling party.

Speed dialing has been applied in both the telephone and telephone network contexts. In the telephone context, the speed dialing system resides in the telephone and comprises a memory -- the repertory -- storing telephone numbers which may be "speed-dialed," and corresponding buttons dedicated to the speed dialing function. The memory typically comprises a plurality of registers, each storing a telephone number previously provided by the telephone user when the user wishes to dial by a short code. When the user wishes to use speed dialing, the user picks up the telephone handset (making the phone go "off-hook") and depresses the speed dialing button associated with the number the user wishes to call. The button signals the speed dialing system that the user wishes to dial the telephone number stored in the register corresponding to the button. The system then synthesizes dual-tone, multi-frequency (or touch-tone) signals in rapid succession. This rapid succession of touch-tones simulates a manually dialed telephone number.

In the network service context, the system works in much the same way. A special node (or switch) is employed which stores repertories of telephone numbers in memory, each associated with a given network customer. As in the telephone context, the telephone numbers of each repertory are provided by the user (or network customer). When the customer wishes to use the speed dialing network service, the user picks up the telephone handset and depresses a sequence (typically 2 or 3) of buttons on the telephone's touch-tone keypad. The depressed sequence of touch-tone buttons is a code which corresponds to one of the telephone numbers stored in the repertory that the customer wishes to call. The node receives the touch-tones along with the number of the calling party (the ANI). The ANI serves to identify the repertory of the calling customer, while the code represented by the touch-tones serves as an index into the repertory. Once the number to be called is identified by the touch-tone code, the node initiates the connection to the called party in conventional fashion.

In both the telephone and telephone network contexts, the user must supply the automatic speed dialer with the list of telephone numbers and along with a correspondence to a button or code for specifying such numbers. This supply process is cumbersome and requires the user to determine for himself the list of numbers which would be most convenient to include in his dialing repertory.

Summary of the Invention

The present invention is directed to a technique for the automatic creation of a repertory for a telecommunication network-based network address access system. In accordance with an illustrative embodiment of the invention relating to telephone network speed dialing, the technique involves the automatic determination of likely called telephone numbers for a given customer based on records of network usage by the customer. Such records are examined for a given period of time (*e.g.*, six months) to determine the N most frequently called numbers (where N is an integer, for example 20). These numbers are then stored as a telephone number repertory file in a

network node database. This file is associated with the customer's ANI. Each such number is stored with a corresponding code which may be searched as an index to the numbers. The correspondence between stored numbers and codes is reported to the customer so that the customer may "speed-dial" the code and, through conventional operation of the node, initiate a connection to the called party.

Although the concepts of the present invention are illustrated with reference to a telephone network, the concepts are equally applicable to other types of networks such as, for example, the Internet, ATM networks, wireless networks, PBXs, *etc.*, where a customer's network usage records are available.

Brief Description of the Drawings

Figure 1 presents an illustrative network architecture for routing calls to an illustrative embodiment of the present invention.

Figure 2 presents an illustrative system for generating a customer's telephone repertory speed-dialing database in accordance with the present invention.

Figure 3 presents a flow chart of the operations of the database processor of Figure 2.

Figure 4 presents a schematic representation of an entry in the customer's repertory database of Figure 2.

Figure 5 presents telecommunication network components at a special service node suitable for providing repertory speed-dialing in accordance with the present invention.

Detailed Description

A. Introduction to the Illustrative Embodiments

The illustrative embodiments of the present invention discussed below each contain two distinct systems: a *repertory generating* system and a *dialing* system. Among other things, the repertory generating system determines what are the most

frequently dialed numbers for a given customer and associates such numbers with speed-dialing codes for storage in a customer repertory database. The dialing system makes use of the information provided to the customer repertory database by the repertory generating system to facilitate the completion of telephone calls.

The descriptions of the illustrative embodiments of the present invention do not focus on the details of conventional telephone network architecture familiar to those of ordinary skill in the art. This has been done so as not to obscure the presentation of the invention. Such details are illustratively discussed in the following U.S. Patents which are incorporated by reference as if fully set-forth herein: U.S. Patents Nos. 5,392,357 and 4,191,860. For the convenience of the reader, a brief discussion of illustrative architectural elements will now be discussed.

In Figure 1, communications originated by a calling party using near side customer equipment (CE) 301 are destined for a called party using far side CE 302, and vice versa. As used herein, "communications" may include analog or digital calls or messages that convey voice, data, facsimile, video or other information. Hereinafter, communications may be referred to simply as "calls."

For convenient data entry, CE 301 may be equipped with a DTMF (touch-tone) generator and a keypad; status indications can be given to the user through one or more display indicators, such as LED display lamps. While CE 301, 302 may be any of a number of communications devices, including cellular phones, facsimile machines, PCs equipped with communications hardware/software, *etc.*, for the illustrative purposes of the immediately following description, it is assumed that CE 301, 302 are conventional telephones.

While telecommunications "access" to special service node 350 can be gained by any convenient access mechanism, such as by using (a) a software defined network (SDN) access number; or (b) a POTS (plain old telephone service) number in conjunction with a premium service such as MEGACOM available from AT&T; or (c) an 800 number, it is assumed, for illustrative purposes, that a calling party using

CE 301 gains access to node 350 by dialing a predetermined toll-free number, such as 1-800-SERVICE.

When that number is dialed, the call is routed by a switch 307 (e.g., a #5ESS[®] electronic switch available from AT&T) in a local exchange carrier (LEC) office 308 serving the calling party. The calling party may be connected directly to LEC office 308 and switch 307, as shown in Figure 1, or connected via a PBX switch or other customer premises equipment, not shown. Switch 307 routes the call to an interexchange carrier switch 310, typically an AT&T #4ESS Access Control Point (ACP) that is part of a switched telecommunications network that is designated generally as 356. Switch 310 responds by generating a signaling message (usually in the well-known CCS7 signaling format) and routing it through a common channel signaling (CCS) network 315 including a plurality of interconnected Signal Transfer Points (STPs) 316, 317, to an InWATS Data Base (IDB) 320, or to a network control point (NCP) in a software defined network, depending upon the subscription plan of the calling party. IDB 320 contains records for each dialed 800 number, and performs a look-up operation in order to generate a routing number associated with the dialed number, which is sent back to switch 310.

In response to the routing number, switch 310 in turn routes the call to special service node 350, usually through other components of switched telecommunications network 356, which may include another #4ESS switch 325 (it should be understood that other access and signaling arrangements may be used to interconnect CE 301 with special service node 350).

When the call is received in the special service node 350, the node may also receive from switch 307, 310 or 325, a CCS message containing the dialed number (DNIS) and automatic number identification (ANI) information corresponding to CE 301. However, the availability of such information depends upon the capabilities of the specific switches and signaling equipment being used by LEC office 308 and network 356. For the purposes of the following explanation, it will be assumed that calling party information is available to the special service node 350.

Once the call is processed by the special service node, the call is routed conventionally, based on a telephone number provided by node 350 in accordance with the present invention, through the switched telecommunications network 356 to the LEC 357 serving the called party. Switch 358 (again, *e.g.*, a #5ESS[®] electronic switch available from AT&T) in turn routes the call to the CE 302 of the called party.

For clarity of explanation, the illustrative embodiments of the present invention are presented as comprising individual functional blocks (including functional blocks labeled as "processors"). The functions these blocks represent may be provided through the use of either shared or dedicated hardware, including, but not limited to, hardware capable of executing software. For example, the functions of processors presented in Figure 2 may be provided by a single shared processor. (Use of the term "processor" should not be construed to refer exclusively to hardware capable of executing software.)

Illustrative embodiments may comprise digital signal processor (DSP) hardware, such as the AT&T DSP16 or DSP32C, read-only memory (ROM) for storing software performing the operations discussed below, and random access memory (RAM) for storing DSP results. Very large scale integration (VLSI) hardware embodiments, as well as custom VLSI circuitry in combination with a general purpose DSP circuit, may also be provided.

B. A System for Generating a Repertory for a Network-Based Speed-Dialing System

Figure 2 presents an illustrative system for generating a customer repertory speed-dialing database in accordance with the present invention. The illustrative system resides in a telecommunication network as an adjunct to, for example, a network switch. The illustrative system may be deployed in a local telephone service provider network, or in a long distance network.

The system of Figure 2 comprises a database processor 5, a customer billing records database 15, and a customer repertory speed-dialing database 25. The

operation of the system of Figure 2 can be readily understood from a flow chart of database processor 5 operation as presented in Figure 3. Processor 5 operates as shown in Figure 3 in response to an initiation signal, as shown in Figure 2.

To generate a repertory speed-dialer database for a given network customer, a customer's ID is required. This ID is obtained from a conventional network customer database. The ID is supplied to database processor 5, which is implemented on conventional computer hardware. The customer ID could be, for example, a customer's telephone number, or any other code which the service provider uses to identify its customers. *See step 50 of Figure 3.*

Database processor 5 then uses the customer ID to index the customer billing record database 15 to determine the telephone numbers most frequently dialed by the customer over a given period of time, such as the last six months of customer service usage. This determination is made by keeping a count of the number of times the customer places a call to a given called number. Database 15 is conventional and is illustratively the type normally maintained by local and/or long distance telephone service providers. In accordance with the illustrative embodiment, the database processor identifies the 20 most frequently called numbers by the given customer. *See step 55 of Figure 3.*

Once the 20 most frequently called numbers have been identified, database processor 5 assigns a speed dialing code to each of the numbers. *See step 60 of Figure 3.* This can be done by assigning a sequence of DTMF tones to each number. Each sequence is a code for that telephone number. For example, the most frequently dialed number receives the code #01, the next most frequently dialed number receives #02, and so on up to #20 for the 20th most frequently dialed number.

Each telephone number and associated speed dialing code for the customer in question is then stored in customer repertory database 25. *See step 65 in Figure 3.* In the illustrative example, there are 20 numbers and associated codes. These 20 numbers and codes form a file in database 25 which is associated with the corresponding customer ID number (which gave rise to the 20 numbers, as discussed

above). An example of such a file is presented in Figure 4. This file is then suitable for use by the telecommunication network-based repertory speed-dialing system to dial telephone numbers in response to receipt of speed dialing codes.

In order for customers to take advantage of an automatically generated repertory database 25 of speed-dialing numbers, the customer has to be informed of the numbers and their associated codes. This can be done simply by providing notification of the capability to the customer (along with a list of the numbers and their codes) in the customer's monthly bill, through a separate mailing, or through telemarketing type telephone contact.

C. The Network-Based Repertory Speed-Dialing System

The speed-dialing system of the first illustrative embodiment is presented in Figure 5. The system incorporates a network node (or switch) 70 which implements speed dialing for a customer and the customer repertory database generated as discussed above. The system of Figure 5 is illustratively located at special service node 350 of Figure 1.

The operation of the system of Figure 5 begins with the reception at switch 70 of a call from a given customer (or a connection with the customer at the point when the customer receives a dial-tone, either of which hereafter referred to as the "call"). The call is routed to the system of Figure 5 in conventional fashion by the telephone network serving the customer, as discussed above. This routing may be facilitated by the customer dialing a special number (such as an 800 number or a code comprising one or more DTMF "touch-tones") which the service provider network uses to route the call to the switch 70 at node 350. Alternatively, switch 70 may be automatically connected with the customer at the point when the customer receives a dial-tone after going "off-hook," assuming the customer is registered as a speed dialing customer. Automatic number identification (ANI) service is employed to identify the calling customer. Switch 70 stores the calling customer's number (the "ANI") in its memory.

Next, the customer dials the speed dialing code of the party to be called (the called party). This may be done with or without a prompt to the customer. The speed dialing code is received by switch 70, which scans the database 25 for the number to dial. The scanning of the database 25 is performed with use of the customer ANI identifying the customer file (such as that depicted in Figure 4). As a result of the scan, the switch 70 retrieves the telephone number of the desired called party. The switch then generates appropriate call routing signals (which may include DTMF tones) to facilitate the completion of call routing to the called party. In this fashion, the speed dialing code has been used to "dial" the called party.

It will be understood that a customer may enter a code which does not correspond to a number in the customer's speed dialing list. When this happens, switch 70 may inform the customer by playing an error signal or message.

D. Discussion

Although a number of specific embodiments of this invention have been shown and described herein, it is to be understood that these embodiments are merely illustrative of the many possible specific arrangements which can be devised in application of the principles of the invention. In light of this disclosure, numerous and varied other arrangements can be devised in accordance with these principles by those of ordinary skill in the art without departing from the spirit and scope of the invention.

For example, it would be possible to implement to principles of the present invention in a PBX which kept track of the telephone numbers dialed by PBX system users. In such case, it would be the PBX which would incorporate the database processor 5 of Figure 2. Database 15 would be populated by information collected by the PBX while database 25 would be created and stored by the PBX in the same manner described above. The PBX would then take the place of network switch 70 in providing speed dialing service.

As discussed above, the creation and use of a customer repertory database depends in part on the ability to identify the customer so that customer usage records can be searched to create and identify the repertory for customer use. Although this has been discussed above in terms of customer ANI and billing records, it should be understood that alternative identification and records may be used. In addition or alternatively to the use of a conventional telephone customer billing record database in building a speed dialing repertory, a customer credit card database which includes records of telephone calls charged to the credit card could be used. In such a case, the customer's credit card number serves as the customer ID. Credit card information could be used instead of or in addition to billing record information. The use of a credit card information (records of calls charged to the card and credit card number) allows there to be a separate speed-dialing repertory for business and personal use, adding flexibility to meet customer needs. In the case where both repertories are used, numbers common to both are advantageously given the same speed dialing code, to facilitate ease of use. So, for example, the speed dialing code for the customer's business office which happens to appear on both his home and calling card repertory speed-dialing lists would be given the same code, perhaps *10.

Correct usage of an embodiment of a speed dialing system in accordance with the present invention may be facilitated by use of an audio response unit in combination with the network switch 70 of Figure 5. Such an audio response unit could announce the number being dialed in response to a speed-dialing code entered by the user. For example, if the user intends to call his or her office, but instead of entering code *10 enters, such a system would announce to the customer a number the customer is not expecting. The customer, recognizing that he or she has entered the wrong code can either hang-up and start again, or enter a special restart code, *e.g.*, *#, which the switch 70 recognizes to (i) trigger the cancellation of dialing based on the previously entered code and (ii) accept a new speed-dialing code from the customer.

Speed-dialing repertories can be updated in accordance with the present invention by the periodic reassessment of a customer's most frequently called numbers. This reassessment could be done once per year, for example. It would be accomplished as discussed above in the section addressing repertory database generation and described in Figures 2 and 3 (the process is initiated by a "repertory update" signal shown in Figure 2). An added feature would be that numbers common to old and new repertories would be given the same speed-dialing code, to facilitate continuity of use while updating the repertory to meet the customer's changing needs. Such a system would thus accomplish the elimination of infrequently called numbers during a given period, and the maintenance of numbers which are popular with the customer. The system thus "follows" the calling habits of the customer.

"Help" functions are very useful in assisting customers in resolving problems with automated system operation without the use of a live attendant or operator. An illustrative help function for use with the present invention would be implemented with a conventional audio response unit adjunct to switch 70. Whenever the customer presses a help code, e.g., *00, the audio response unit can, in conjunction with the repertory database 25, read the customer's speed dialing codes to the customer, along with the corresponding telephone numbers. In this way, the customer's recollection can be refreshed for subsequent use of the system. In the context of a switching system coupled to a plurality of telephones which have display capabilities, such as a conventional centrex-based PBX coupled to ISDN telephone terminals, a help function can be implemented by the display of speed-dialing codes along with their corresponding telephone numbers.

The repertory database created from customer records is described above as used in the network to provide network-based speed dialing. However, the present invention may be used in combination with a conventional telephone-based speed dialer. In such a situation, the repertory database 25 (for example) could be downloaded into a memory into a telephone having conventional speed dialing capability. Downloading could be accomplished using the data channel of an ISDN

system, conventional DTMF signalling, or using data modems and conventional telephone network interface hardware and software. Illustratively, the switch 70 of Figure 5, located at node 350, would receive a call from a telephone having the capability of receiving a downloaded speed dialing repertory of telephone numbers. Such downloading would be accomplished through switch 70, which would receive the incoming call and provide the repertory database 25 information to the calling telephone. The calling telephone would be conventional (with the addition of, *e.g.*, a DTMF receiver and software to store downloaded numbers, however the repertory data would not since it is being collected from the network records in accordance with illustrative embodiments discussed above.

As an alternative to the use of a conventional speed dialing telephone, a telephone having a liquid crystal display for each speed dialing button could be used. Each display would show the number associated with that button. In this way, updates to downloaded telephone repertory data could be readily presented to the user.

1. A method of generating a database for use controlling a telecommunication network by network users, the method comprising the steps of:

analyzing network usage records to determine network addresses to which a network user has frequently attempted to establish a communication path through the network;

determining a code corresponding to a determined network address;

storing said addresses and corresponding code in a storage medium.
2. The method of claim 1 wherein said address comprises a telephone number.
3. The method of claim 1 wherein said network usage records comprise network billing records.
4. The method of claim 3 wherein said network billing records comprise credit card billing records.
5. The method of claim 1 wherein said network usage records comprise PBX records.
6. The method of claim 1 wherein said network comprises a telephone network and said network usage records comprise network billing records.
7. The method of claim 1 further comprising the step of establishing a network connection between a communication device of the user and a communication device associated with a network address which corresponds to a code received from the communication device of the user.

8. The method of claim 1 wherein the steps of the method are repeated over time to facilitate the storage of codes and network addresses which reflect substantially current network usage.
9. The method of claim 1 wherein the network user is registered as a user of the network.
10. The method of claim 1 wherein the network user is a person who uses the network in the name of a registered network user.
11. The method of claim 1 further comprising the step of transmitting one or more stored addresses to a network terminal.
12. The method of claim 11 wherein said network terminal comprises a telephone.
13. An apparatus for generating a database for use controlling a telecommunication network by network users, the apparatus comprising:
 - means for analyzing network usage records to determine network addresses to which a network user has frequently attempted to establish a communication path through the network;
 - means for determining a code corresponding to a determined network address;
 - means for storing said addresses and corresponding code.
14. The apparatus of claim 13 wherein said address comprises a telephone number.

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15. The apparatus of claim 13 wherein said network usage records comprise network billing records.
16. The apparatus of claim 15 wherein said network billing records comprise credit card billing records.
17. The apparatus of claim 13 wherein said network usage records comprise PBX records.
18. The apparatus of claim 13 wherein said network comprises a telephone network and said network usage records comprise network billing records.
19. The apparatus of claim 13 further comprising means for establishing a network connection between a communication device of the user and a communication device associated with a network address which corresponds to a code received from the communication device of the user.
20. The apparatus of claim 13 wherein the network user is registered as a user of the network.
21. The apparatus of claim 13 wherein the network user is a person who uses the network in the name of a registered network user.
22. The apparatus of claim 13 further comprising means for transmitting one or more stored addresses and corresponding codes to a network terminal.

23. A system for use in a telecommunications network, the system facilitating a network user's establishing a communication path through the network, the system comprising:

a network user repertory database comprising a set of network addresses and corresponding codes, the set of network addresses representing addresses to which the user has frequently attempted to establish communication, according to network usage records;

means, coupled to the database, for determining a network address based on a code received from the user; and

means for generating control signals to establish of a communication path through the network based on the determined network address.

24. The system of claim 23 wherein said determined network address comprises a telephone number.

25. The system of claim 23 wherein said network usage records comprise network billing records.

26. The system of claim 25 wherein said billing records comprise credit card billing records.

27. The system of claim 23 wherein said network comprises a telephone network and said network usage records comprise telephone network billing records.

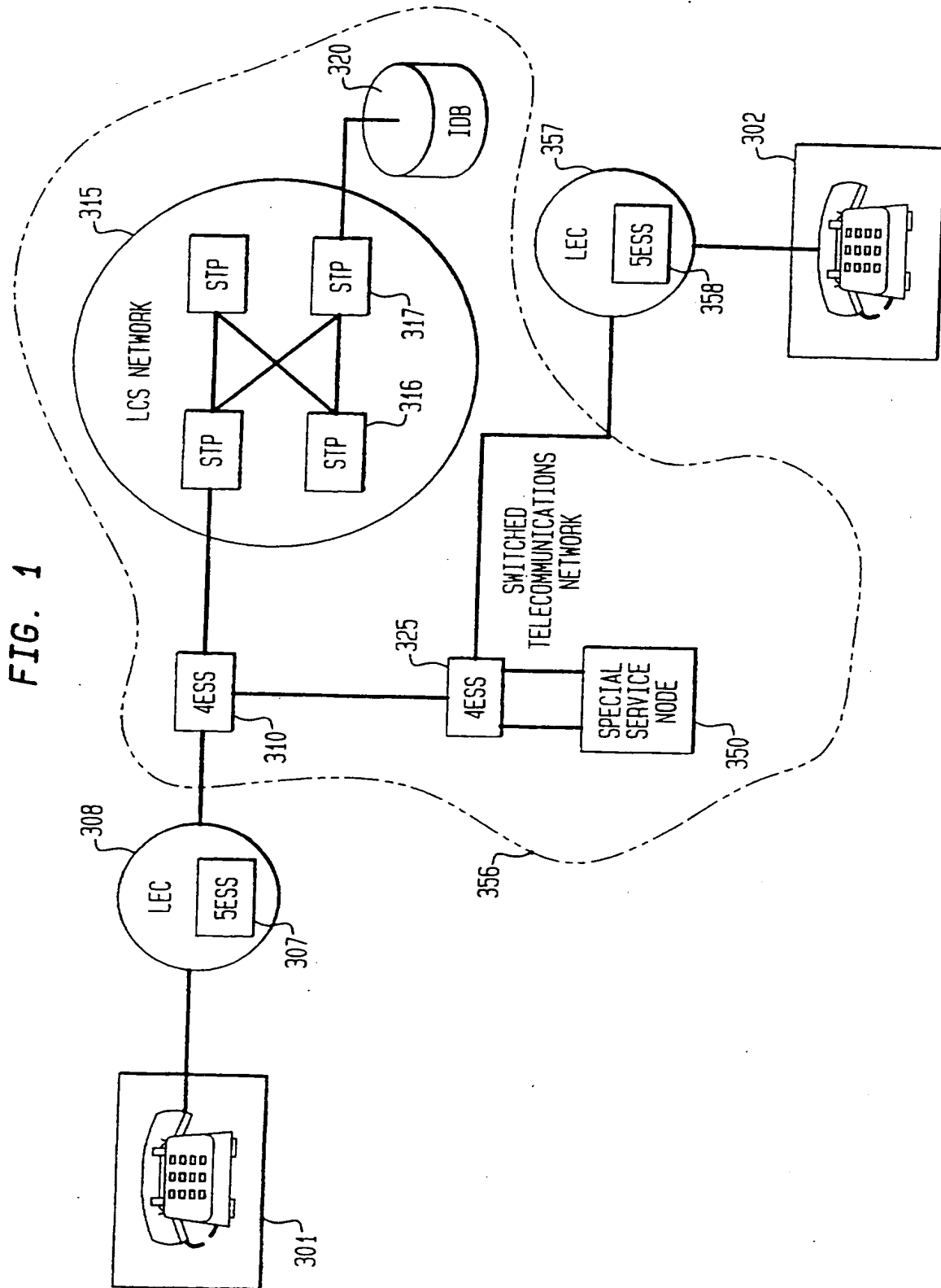
28. A method of generating a database for use controlling a telecommunication network by network users, the method comprising the steps of:

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analyzing network usage records to determine network addresses to which a network user has frequently attempted to establish a communication path through the network;
and

storing said addresses in a storage medium; and

transmitting one or more stored addresses to a network terminal.



2/3

FIG. 2

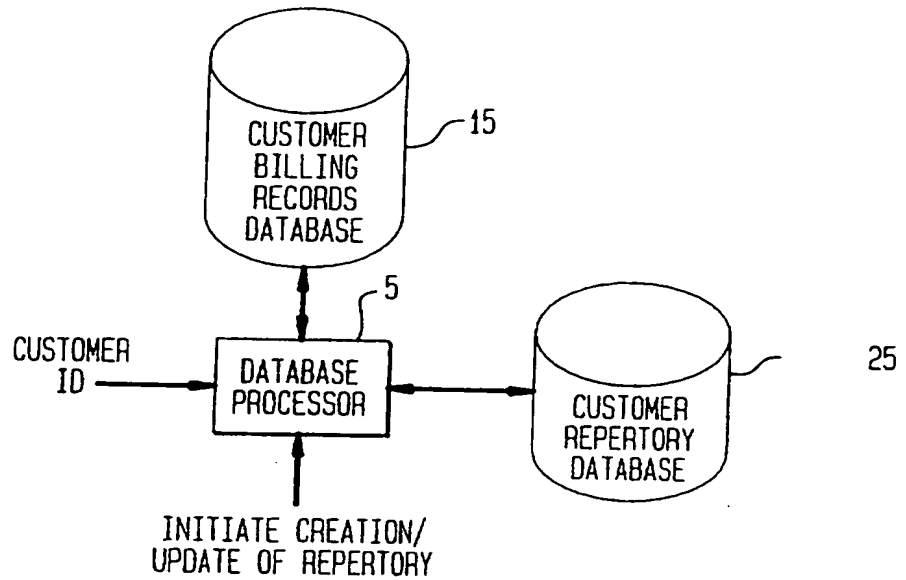


FIG. 3

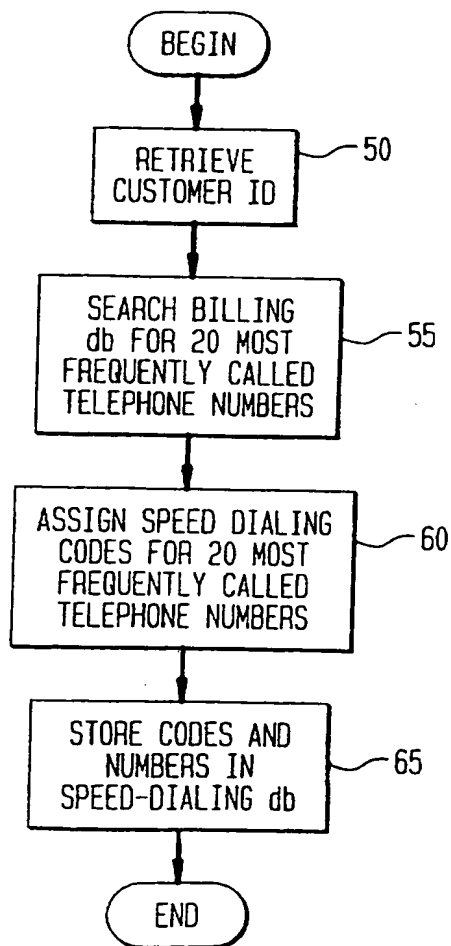


FIG. 4

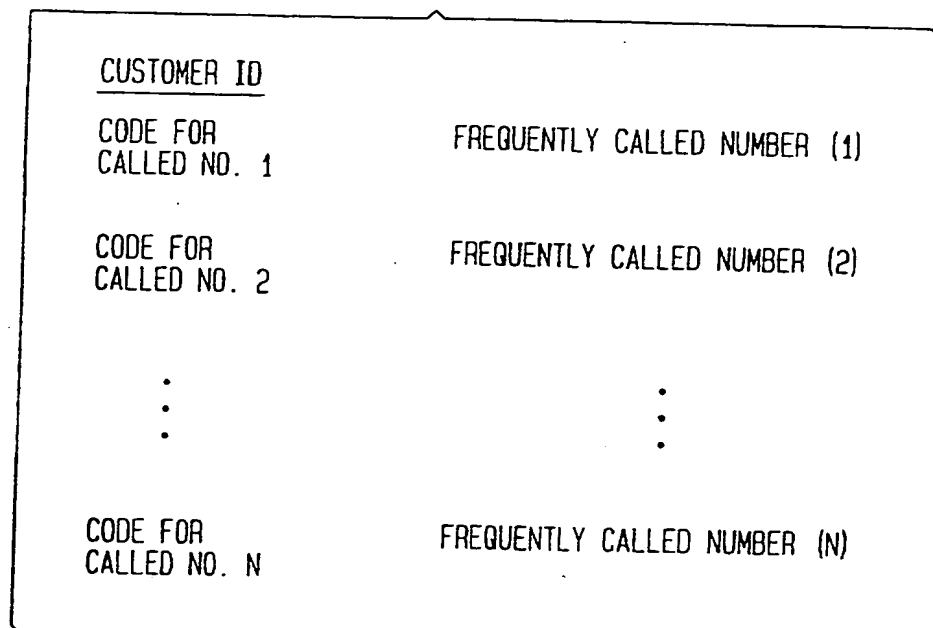
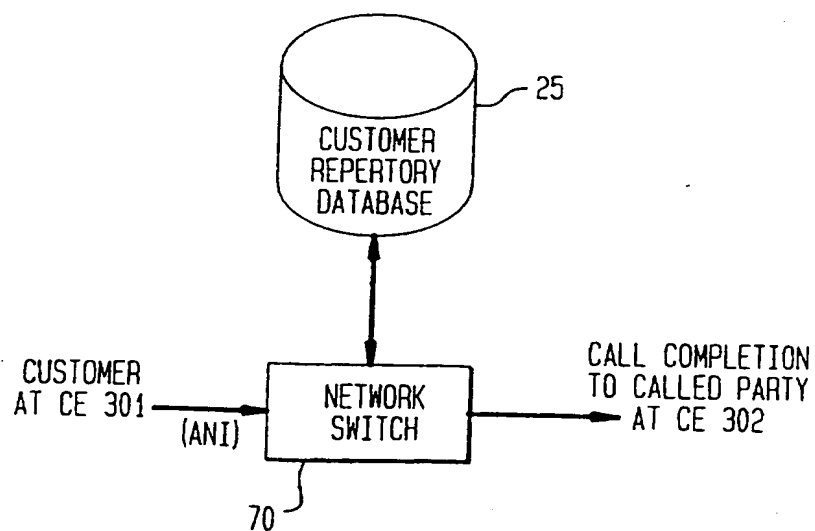


FIG. 5



INTERNATIONAL SEARCH REPORT

Int. lional application No.
PCT/US96/18265

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04M 3/42, 1/00, 3/00, 15/00

US CL :379/112, 216, 355, 356, 357

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/112, 113, 114, 121, 130, 140, 201, 216, 355, 356, 357

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
noneElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
none

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,454,029 A (NODA) 26 September 1995, see abstract and figure 1.	1-28
A	US 5,272,748 A (DAVIS) 21 December 1993, see abstract and figure 3.	1-28
A	US 5,204,894 A (DARDEN) 20 April 1993, see abstract.	1-28

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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